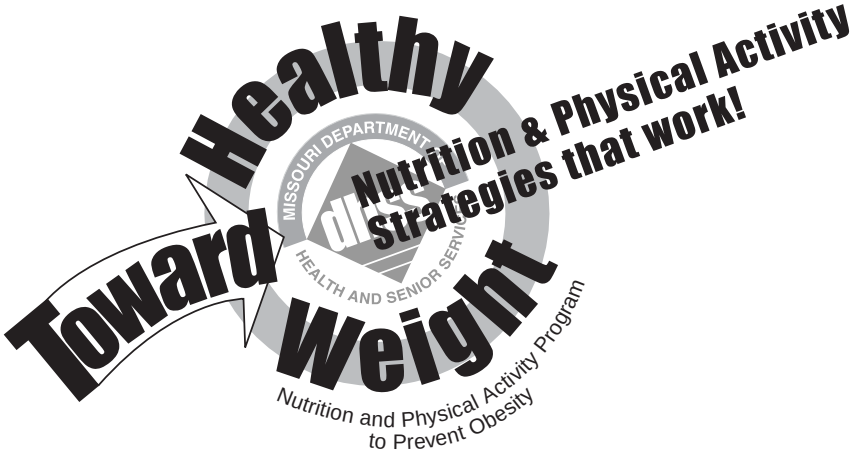
Strategy for Reducing Obesity and Other Chronic Diseases:

Caloric Balance

Dietary Determinants of Energy Imbalance



Rationale

Weight gain occurs when energy intake (caloric intake) exceeds energy expenditure. There are several dietary determinants that affect energy intake and energy use by the body. While the literature provides evidence that these dietary determinants affect weight, there are very few, if any, interventions associated with the dietary determinants that have been proven to be effective. Many of the strategies, though, are promising.

The Healthy People 2010 includes objectives to have at least 50 percent of persons aged 2 years and older consume at least 6 servings of grain products per day with at least 3 of those servings being whole grains, to have at least 75 percent of persons the same ages consume no more than 30 percent of calories from total fat, and to have 75 percent of persons the same ages meet dietary recommendations for calcium.[1]

Caloric Balance Strategies

Reducing overall energy intake by whatever method, regardless of physical activity levels, can result in weight maintenance or loss depending upon the degree of reduction.

Strategies with Evidence

Reduce Consumption of Dietary Fat—there is abundant cross-sectional evidence that supports the premise that dietary fat is positively associated with obesity, primarily because higher intakes of dietary fat are associated with higher energy intakes. There are several ways in which dietary fat leads to excess energy intake:

- Its low satiety value as compared to other macronutrients[2,3,4,5,6] (protein provides the highest amount of satiety, followed by carbohydrates, then fats[2]), and,
- Its high palatability, high energy density, efficient storage, and lower oxidative rates.[7,8]

Not all dietary fats have the same oxidative rates; in general, unsaturated fatty acids are oxidized more rapidly than saturated fats, which lead to greater energy expenditure.[9,10] In controlled settings, dietary fat independent of caloric intake does not lead to obesity. However, in a free-living situation with individuals eating ad libitum, it appears that

- Higher fat diets are much more likely to lead to excess caloric intake than lower fat diets.[7]
- If the percentage of fat in the diet is lowered enough, most individuals could eat ad libitum and not gain weight.[11]
- There are exceptions to this rule. Other diets, such as high protein, low carbohydrate diets may be high in fat. The ketosis, which is induced by this type of diet suppresses the appetite and results in lower calorie intakes.[12]

However, low fat diets have been shown repeatedly to be more effective than low

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carbohydrate diets for the prevention of overweight and for long-term weight maintenance.[11]

Decreasing fat intake as a strategy for improving health has been used in the following interventions, for which there is some evidence of effectiveness: 1 percent or Less Campaign, providing cooking demonstrations on how to prepare food with less fat, and encouraging restaurants to label heart-healthy menu items.

Increase Consumption of Dietary Fiber—cross-sectional and ecological studies conducted in developed nations have shown that high fiber intake, or fiber intake at least at the recommended level (25 grams per day), is associated with less obesity. Associating dietary fiber with less total caloric consumption can be explained by its low energy density, increased satiety level, bulkiness (which limits impulsive intake of food), and its potential to inhibit macronutrient absorption.[13] In almost all studies examining weight loss, individuals who consume a combination of water soluble and water insoluble fiber sources reported greater rates of weight loss as compared to those who follow low-fiber diets regardless of whether energy intake was fixed or ad libitum.[13] Increasing dietary fiber consumption as a strategy for improving health has been used with some evidence of effectiveness in the 5 A Day for Better Health intervention.

Increase Consumption of Low Energy Dense Foods—nutrition researchers have shown that low energy dense foods, that is those that have fewer calories per given mass, play a role in weight loss and energy balance maintenance by providing adequate, or greater, amounts of food while providing less energy. Water, dietary fat, and dietary fiber have all been shown to be predictors of energy density; however, water has been shown to have the greatest influence on energy density because it contributes to the food's weight without the addition of calories.[14]

Increasing consumption of low energy dense foods as a strategy for improving health has been used with some evidence of effectiveness in the 5 A Day for Better Health intervention.

Decrease Consumption of Meals Away From Home—frequent consumption of foods away from home has been associated with a diet high in fat and calories, and therefore increased energy density.[15,16,17] When eating at fast food and other restaurants, more calories are likely to be consumed because of larger portion sizes and/or increased palatability and variety of foods available for consumption.[18,19] While the causality has not been definitely determined, most studies have found a positive association between consumption of food away from home and adiposity.

Increase Appropriate Family/ Parental Involvement—most of the parenting research has focused on determinants of eating behaviors or eating disorders; direct connections with obesity have been few.

It has been shown that mothers who were more controlling of their 3- to 5-year-old's food intake had children who showed:

- higher rates of eating,
- less ability to self-regulate energy intake, and
- increased adiposity.[20,21,22]

Higher levels of maternal restriction predicted:

- higher levels of snacking in girls 3-5 years of age,[22,23] and,
- restricting access to palatable foods has been shown to increase children's attention on and desire for that food.[24]

On the other hand, excessively permissive child-feeding practices may also have deleterious consequences.

- Children allowed to snack ad libitum had higher caloric intakes than children provided nutritious snacks at designated times.[25]
- Foods (usually less nutritious foods high in fat and/or sugar) used as a reward, tend to increase

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child preference for that food.
- In contrast, having children eat a food (usually a more nutritious food) in order to obtain a reward tends to decrease child preference for that food.[26]

For intervention research and programs, family and parental involvement is critical and insures a more effective program.[27]

- Family involvement has been shown to increase student knowledge and positive attitudes toward healthy habits in a dose response manner.[28]
- Numerous school interventions add a parent component; however, programs frequently report low success of getting parents meaningfully involved.[29,30]
- Take-home materials alone may not be powerful enough to produce long-term changes.[31]
- It has also been recommended that overweight prevention programs include more information to improve general parenting skills.[32]

Increase Intake of Calcium and Dairy Products—low intake of dietary calcium had been associated with overweight in both sexes and different age groups.[33,34,35]

- One year of increased calcium intake in obese patients resulted in a 4.9 kg weight loss.
- Increased calcium is believed to suppress a hormone involved in regulating lipogenesis and lipolysis, thus decreasing body fat storage.[35] In a double-blind, placebo controlled randomized trial of 780 women, significant negative associations for weight were found. The calcium supplemented group had a significant weight loss compared to the placebo group over the four years. About 3 percent of the variance in body weight or an 8 kg difference was associated with an intake of 1000 mg of calcium daily.[33] The question arises whether the calcium or whether a combination of nutrients found in milk or dairy products is related to this observed effect. There is at least one study that has shown that weight loss is greater when subjects consumed the calcium in the form of dairy products as compared to when calcium is ingested in the form of a supplement.[36]

Strategies with Mixed Evidence

Dietary Pattern—although distinct dietary patterns have been variously defined and identified by different researchers and based on very different food groupings, with results that have not been completely consistent, in general the findings suggest that a "Western" type diet is associated with overweight. The dietary patterns approach has successfully been applied to the study of cancer[37,38] and coronary heart disease,[39,40,41] and has shown that a "Western" type diet (characterized by a relatively high intake of red meat, high-fat dairy and refined grains and a relatively low intake of fruits, vegetables, and whole grains) was associated with health risk. Recently, factor or cluster analysis of food groups consumed to identify predominant dietary patterns has been applied to the study of obesity.[38,42,43,44,45,46,47,48,49,50] In most cases, significant differences in BMI were found on the basis of the dietary pattern, even after controlling for total energy intake. Outside of the U.S., the transition from more traditional dietary patterns to a "Western" dietary pattern has also been associated with increased overweight, a trend that was observed without a concurrent increase in fat intake.[50] Unfortunately, most dietary pattern studies have been cross-sectional in design. The focus of most studies was older Caucasian adults.

Strategies with Insufficient Evidence

Decrease Consumption of Sweetened Beverages—there is a large amount of literature documenting the increase in the consumption of sweetened beverages, a trend that parallels the national increase in

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adiposity; however, very few studies to date have examined the relationship between soda/sweetened beverages and adiposity. In a randomized trial, sugar sweetened soft drink intake was shown to increase weight progressively as compared to intake of artificially sweetened soft drinks. When sugar enhanced foods are eaten, people tend to decrease their subsequent intake of food to a greater degree than after the equivalent intake of sugar-sweetened drinks. This may be related to reduced gastric distention and faster transit times, so the calories are not evident to the body and subsequent intake is not reduced to the same degree. In terms of weight association, each additional serving of a sweetened beverage that is consumed daily for a period of 1 ½ years, increased the risk of children being overweight by 60 percent after controlling for other potentially confounding variables.[51]

Decrease Size of Portions Consumed—larger portion sizes are positively associated with increases in calories of the specific food item consumed and it is very likely that increasing portion sizes is contributing to excess energy intake. There has been an increased daily energy intake of 340 kcal per day by Americans between 1970 and 1994.[52] Adults who were served varied portion sizes at lunch ate more as the portions servings increased. People served the largest portion sizes ate 30 percent more than people who were served the smaller portion sizes, although the smallest portion sizes were larger than what is usually eaten. After-meal satiety ratings were similar regardless of the portion served or eaten.[53] Children use their portion size to determine how much to eat.[54] Three-year olds are not influenced by portion size served, but five-year old children are.[55] When children serve themselves they eat 25 percent less of an entrée than when served a large entrée portion. Doubling the age appropriate size of an entrée served to children increased the amount they ate by 25 percent and their energy intake by 15 percent. They took larger bites and did not decrease the intake of other foods served.[56]

Adapted from the following documents: *Centers for Disease Control and Prevention Technical Assistance Manual for State Nutrition and Physical Activity Programs to Prevent Obesity and Other Chronic Diseases; Evidence Based Practices for Overweight and Obesity: A Review of the Literature, Glenda Nickell, Sinclair School of Nursing, University of Missouri-Columbia, 2003; Missouri Department of Health and Senior Services Draft Obesity Burden Report, 2004.*

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